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NOTES ON CERTAIN PHILIPPINE SPECIES OF VIVIPARUS.

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Several months ago Mr. Walter F. Webb, of Rochester, N. Y., placed in my hands for identification a small collection of Philippine *Vivipari.* The very considerable search of the literature that was found necessary to determine the proper names to be used for certain species has brought about some interesting results in the matter of nomenclature.

I.

PALUDINA (VIVIPARA) CARINATA Auct.

No less than four distinct species have been described by as many different authors as *Paludina carinata* or *Vivipara carinata*, viz:

1820–3. *Paludina carinata* Swainson. Ganges.
1827. *Paludina carinata* Valenciennes. Mexico.
1863. *Paludina carinata* Reeve. Philippine Is.
1867. *Vivipara carinata* Bartsch. Philippine Is.

It will be more convenient to treat these species separately.

II.

PALUDINA CARINATA Sw. Pl. VIII, fig. 1.

Paludina carinata Swainson. Zool. Ills., Series I, 1820–3, pl. 93, center figure.

Swainson's original figure is reproduced as above and his brief description is as follows:

"*P. testa parva, olivacea; spira apertura longiore, apice obtuso, rufo; anfractu basili medio leviter carinato; umbilico obsoleto.*

"Shell small, olive; spire longer than the aperture; the tip obtuse, rufous; basal whorl slightly carinated in the middle; umbilicus obsolete.

"A distinct species which is never found larger than the figure. I once saw near 100 which had been picked up on the banks of the Ganges; the spire is rather lengthened, always obtuse, and the umbilicus even less than the last" (*P. unicolor*).

No measurements are given, but the figure (there is only one) measures: alt. 21, diam. 16 mm.

This species seems to have entirely dropped out of sight in recent years. It has been referred to *V. dissimilis* (Müll.) by Mörch (Cat. Yoldi, 1852, p. 52), Troschel (ubi?) and von Martens (Mal. Blätt., 1865, p. 148). Frauenfeld (Verzeichniss, Paludina, 1864, p. 584) referred it to *V. remossii* (Phil.). Hanley and Theobald (Con. Ind., 1876; p. xvii, n. 7) simply give the above opinions. The species is not referred to by Kuester (Con. Cab., Paludina, 1852) nor by Reeve in the Conchologia Iconica (1863) except as hereinafter stated, nor by Kobelt in his recent (1906–9) monograph in the Conchylien Cabinet, nor by Bartsch (Pr. U. S. Nat. Mus., XXXII, 1907, pp. 135–150), nor by Preston in "The Fauna of British India" (1915).

But it is clear that Swainson's species was an Indian one and, whatever may be its standing at the present time in the Indian fauna, it is entirely different from any Philippine species and by its priority prevents the use of the name by any subsequent author either in *Paludina*, *Vivipara* or *Viviparus*.

III.

PALUDINA CARINATA Valenciennes.

See No. X.

IV.

PALUDINA CARINATA Reeve.

Paludina carinata Reeve. Con. Icon., Paludina, 1863, Sp. 53, pl. IX, fig. 53.

Reeve in his text gives no authority for the specific name and the species is usually credited to him, but in the index the species is credited to Swainson. It is possible that he thought that the shell that he described and figured was the same as Swainson's species. Frauenfeld (Verzeichniss, Paludina, 1864, p. 584) expresses the opinion that Reeve's species is really the same, but the figure, description, such as it is, and the locality, if correct, renders it quite improbable.

I do not think either that the shell figured by Bartsch as this species is really the same.

Reeve as usual gives no dimensions, but his figure measures: alt. 25, diam. 20; aperture, alt. 13.5, diam. 12 mm.

The type, said by Reeve to be in the Cuming Collection, seems to have been lost or mislaid as Mr. H. C. Fulton, who made a search for it at my request, was unable to find it at the British Museum.

I have before me four shells that I believe represent this species and which are figured on pl. IX, figs. 1–4. Two (figs. 1 and 2) are from the Andrews collection and were sent to Mrs. Andrews by Dr. Wesley Newcomb as *V. amplior* Rve., and as from the Philippine Islands. They are clearly not Reeve's *amplior*, which Frauenfeld (Verzeichniss, p. 569) considers the same as Mousson's *V. lineolatus amplus* and Kobelt (Con. Cab., Viviparidae, 1908, p. 260) calls a variety of *V. javanicus*.

The third specimen (fig. 3) is No. 3252 of the collection of the Museum of Zoology, University of Michigan, and formed a part of the collection of Joseph Monds, of Salem, Mass., purchased by the University in 1855. It was originally unnamed and is labeled "Manilla."

The fourth (fig. 4), (Coll. Walker, No. 31774) was part of the Quadras collection and has his original label "*Pal. carinata* Rve., Rio Pasig, Manila." With it was a larger shell of apparently a different species.

As Reeve's type has disappeared, I propose to call the species represented by these specimens *Viviparus pseudocarinatus*, fig. 1 being the type and the others paratypes. If Reeve's type should be found and prove to be identical, his specific name will be superseded by *pseudocarinatus*.

Viviparus pseudocarinatus may be described as follows: Shell globose-conic, apex obtuse, narrowly but deeply, umbilicate; whorls five; apical whorls dark purple, which after the third whorl becomes lighter and gradually fades into a yellowish-green on the body-whorl; the dark color of the upper whorls is lighter towards the sutures; on the last half of the body-whorl of Nos. 1 and 3 are several darker, longitudinal strigations representing, probably, rest periods. The lips of Nos. 1 and 2 are sharp and uncolored, having been taken apparently between rest periods; No. 3 has the remains of a dark brown or blackish margin on the lip, and on No. 4 the lip is thickened and deep black. All four shells are quite acutely carinated on the periphery of the upper whorls and in the three larger ones the body-whorl drops slightly below the carina of the preceding whorl and exposes it above the suture, but the carina rapidly diminishes in prominence and is practically obsolete before reaching the lip, which is regularly rounded. The lines of growth are regular but very light, and the entire surface is covered with exceedingly fine, spiral striæ, scarcely discernible on the upper whorls, but becoming stronger on the base of the body-whorl; these lines especially on the upper whorls are more or less interrupted by the growth lines giving the appearance of very minute punctations.

The four shells measure as follows:

No. 1, alt. 22.5, diam, 17.5; aperture, alt. 12.8, width, 11.4 mm.

No. 2, alt. 20.00, diam. 14.5; aperture, alt. 11.2, width, 8.9 mm.

No. 3, alt. 22.1, diam. 17.1; aperture, alt. 13.0, width, 10.0 mm.

No. 4, alt. 16.9, diam. 12.8; aperture, alt. 9.6, width, 8.4 mm.

Unfortunately No. 4 is the only one with its operculum. This (Pl. 8, fig. 7) is like that of *V. costatus* (Q. and G.) in having the inner surface divided into three distinct areas with the central and outer portions smooth and polished, but it differs from that species in having the intermediate area without granulation, it being finely and concentrically striate.

V.

VIVIPARA CARINATA Bartsch. Pl. IX, fig. 5.

Vivipara carinata Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 141, pl. XI, fig. 14.

As already stated I do not think that the shell figured by Bartsch as *carinata* Rve. is really that species. Bartsch's specimen apparently belongs to a larger, more elongated species and, if mature, lacks the black peritreme that seems characteristic of *carinata* Rve. The color is also different.

The specimen that I have figured for comparison with what I believe to be the genuine *carinata* Rve. and which seems to agree very exactly with that figured by Bartsch, was sent by Dr. Wesley Newcomb to the late Mrs. George Andrews with another, which was correctly named as *V. cumingii* Rve. It is No. 47035 Coll. Walker and measures: alt. 28.5, diam. 21.7; aperture, alt. 16.2, width 13.1 mm.

As "carinata" can not be used for either Reeve's or Bartsch's species and the two are evidently different, the better course would seem to be to rename the form figured and described by Bartsch and to leave Reeve's *carinata* to stand for further consideration. I would propose that the species figured and described by Bartsch be called *V. bartschi*, the type being No. 103666, U. S. Nat. Museum.

VI.

PALUDINA CUMINGII Reeve. Pl. IX, fig. 7.

Paludina cumingii Reeve. Con. Icon., Paludina, 1862, Sp. 11, pl. III, fig. 11.

This species will also have to be renamed, as "*Paludina cumingii*" was used by d'Orbigny in 1835 for the South American species now known as *Littoridina cumingii* (d'Orb.). Reeve himself says that the name had been used by d'Orbigny, but attempts to avoid the duplication by stating that d'Orbigny's species is a *Paludestrina*. This, of course, is impossible under the international code.

To make the change as inconspicuous as possible, I would propose that the species hereafter be known as *Viviparus cumingianus*.

Cumingianus is a large, well-marked species and was excellently figured by Reeve. It was the first of the more-widely umbilicated Philippine species to be described and is not likely to be confounded with any of its contemporaneous species.

The characteristic specimen figured is from the MacAndrew collection (Coll. Walker, No. 46916) and measures: alt. 39.7, diam. 30.5 mm. Another with it measures: alt. 36.5, diam. 29 mm. This specimen has its operculum, which is of the characteristic *javanicus* type.

The specimen figured by Bartsch (Pr. U. S. N. M., XXXII, 1907, pl. X, fig. 7) is apparently immature as it measures only alt. 17.1, diam. 14.8 mm.

Autoptically unknown to Frauenfeld, von Martens and Kobelt, the first two express no opinion in regard to it, but the latter (Con. Cab., Viviparidae, 1908, p. 273) thinks that it is probably a thick-shelled variety of *V. costatus* (Q. and G.); but that view is not tenable.

VII.

VIVIPARUS ANGULARIS (Müller). Pl. VIII, figs. 4–5.

Nerita angularis Müller. Hist. Verm., II, 1774, p. 187.

Helix angularis Chemnitz. Con. Cab., IX, 1786, p. 160, pl. 134, figs. 1222-1223.

Müller's description of his *Nerita angularis* is as follows:

"*Nerita testa imperforata, virescente, anfractibus spiraliter angulatis, fauce alba.*

"*Cochlea virginiana e flavo viridescens non fasciata.*"

"List. Syn. t. 127, f. 27.

"Dan. Kant-neriten
long. 12 lin. lat. 6 lin.

"*Testa opaca, conica, glabra virescens striis transversis subtillimis, spiralibus tribus in singulo anfractu elevatis, acutis. Anfractus quinque prope perpendiculares.*

"*Apertura retundata, ad anfractum vicinum in angulum producta. Foramen vel umbilicus nullus. Faux calcarea. Striæ spirales in quibusdam evanescunt.*

"*Figura Listeri nostris major, caeterum refert. In flumine Chinensi emporium Canton alluente.*"

His reference to Lister was an unfortunate one as the two species have nothing in common. Chemnitz in 1786 expressed his surprise at the approximation. Lister's species was undoubtedly that subsequently described by Say (1817) as *Limnæa decisa* and now known as *Campeloma decisum*. As the facsimile of Lister's figure given by Binney (L. and F.-W. Shells, III, 1865, p. 43, fig. 86) is not a satisfactory reproduction of the original figure, I give a photographic copy on pl. VIII, fig. 6.

As to whether Müller's species was the Chinese species commonly known as *V. quadratus* (Bens.) or the Philippine species often referred to *V. costatus* (Q. and G.), there has been a very radical and long-continued difference of opinion among conchologists.

Mousson in 1849 (Moll. Jav., p. 62) according to von Martens (Moll. Weber, 1897, p. 21) recognized that the shell figured by Chemnitz as *Helix angularis* was different from that figured by Philippi as *Paludina angularis*, but overlooked the fact that it was the *P. quadrata* of Benson.

Philippi (Abbildungen, I, 1845, pl. I, fig. 10) identified it with the species described by Quoy and Gaimard in 1832 as *P. costata*.

Kuester (Con. Cab., Paludina, 1862, p. 26) followed Philippi.

Reeve (Con. Icon., Paludina, 1862) referred the Philippine species to *angularis*, which he considered distinct from *costata*, though he remarks that the two species are very closely allied.

Frauenfeld in 1864 (Verzeichniss, Paludina, p. 571) also referred the Philippine species to *angularis*.

Von Martens in 1869 (Mal. Blätt., p. 145) seems to have been the first to refer Müller's species to the well-known Chinese form commonly called *quadrata* Bens.

Morelet in 1869 (J. de Con., XVII, p. 403) argued the question at considerable length and refused to follow von Martens. But he makes no reference to Chemnitz either in his synonymy or in his discussion.

Issel in 1874 (Moll. Born., p. 90) followed von Martens.

The Sarasins (Suessw. Moll. Celebes, 1898, p. 59), while they make no reference either to *angularis* Müll. or to *quadrata* Bens., refer the Celebes species to *costata* Q. and G. and therefore impliedly endorse von Martens' position.

In 1897 von Martens (Moll. Weber, p. 20) reaffirmed his position of 1865.

Bartsch in his monographic paper on "The Philippine Pond Snails of the Genus Vivipara" (Pr. U. S. Nat. Mus., XXXII, 1907, pp. 135–150) followed Philippi and referred the Philippine species to *angularis* Müll.

Kobelt in his recent monograph of the Viviparidæ (Con. Cab., 1908, p. 230) adopts von Martens' position and calls the Philippine species *costata* Q. and G. But while he states (l. c. p. 122) that in his opinion the smaller, spirally-sculptured Chinese species should be divided into groups represented by *angularis* Müll. and *quadrata* Bens., he retains Benson's name for practically the whole Chinese series and neither figures nor describes, except in a very general way, the particular Chinese form that he would consider to be the real *angularis.*

None of the above-mentioned authors with the exception of Philippi, Kuster and von Martens, refer in any way to the figures and remarks of Chemnitz in the original Conchylien Cabinet. If they were acquainted with that work they omitted to make any reference to it, and if they were not it is difficult to understand how they came to refer *costata* Q. and G. to Müller's species.

I am indebted to Dr. Pilsbry for the reference to Chemnitz, the photographs of his figures reproduced on pl. VIII, the translation of his remarks and for permission to use the illuminating note that follows.

The translation is as follows:

"Tab. 134. Fig. 1222. 1223.

"Ex Museo Spongleriano.

"The greenish river-snail with three-fold keels on each whorl.

"*Helix angularis, testa conica, viridescente, in quovis anfractu tricarinata, apertura rotunda subangulari.*"

Müller, Histor. Verm. no. 373, p. 187.

Then follows Müller's diagnosis.

"This river snail is covered with a dark green coat. It has a quite conic formation, and a mainly circular, but still somewhat angular, aperture. It will be most conspicuously and recognizably distinguished from other snails by the three white angles or perceptibly raised, parallel, transverse striæ, which are seen upon the whorls. Because it is seen to be thus somewhat angular in its formation and aperture, our renowned Müller has called it *Cochleam angularem.* It lives in the Chinese rivers, has a length of only sixteen lines and is certainly unknown at present to most lovers of shells; hence it is rare and uncommon. I do not comprehend how Müller could find it like the figure of Lister, tab. 127, no. 27, which he refers to in his Hist. Verm."

Dr. Pilsbry adds: "Müller's *angularis* does not depend upon Lister, he notes a discrepancy in size. I have therefore had Chemnitz's figures copied. Nearly all of Müller's exotic shells were from the Spengler collection. and there is every reason to believe that Chemnitz figured one of the type lot from the same collection."

It is only necessary, in addition, to compare Chemnitz's figures with a typical specimen of *quadrata* Bens. from China (Coll. Walker, No. 46135) figured on pl. IX, fig. 10, and Quoy and Gaimard's figures of the Celebes type of their *costata* (pl. VIII, figs. 9–10) to come to the conclusion reached by von Martens.

Morelet's remark (l. c. p. 407) that *Paludina quadrata* is distinguished by its more elongated form, less shouldered spire and a proportionately smaller aperture is a very apt statement of the difference between Chemnitz's and Quoy and Gaimard's figures and practically convicts him out of his own mouth.

To which of the many described forms of the protean Chinese species, *angularis* should be referred is "another story" and outside the purview of this paper. But there can be no doubt but that Müller's specific name should be associated with the Chinese rather than with the Philippine species.

VIII.

VIVIPARUS COSTATUS (Quoy and Gaimard. Pl. VIII, figs. 9–13.
Pl. IX, fig. 6.

Paludina costata Quoy and Gaimard. Voy. Astrolabe, III, 1832, p. 170, pl. 58, figs. 1–5.

Type locality: Lac de Tondano, N. Celebes.

It is not entirely certain that Quoy and Gaimard's name can be retained for this species.

Frauenfeld (Verzeichniss, Paludina, 1864, p. 571) has considered it to be the same as Lesson's *P. tricostata* from New Guinea described in 1830 (Voy. Coquille, Zool., II, p. 349).

Von Martens (Moll. Weber, 1897, p. 21) has also made the same suggestion. If so, Lesson's name would have priority.

Lesson did not figure his species, but his description may be translated as follows:

"Shell conic, inflated, of a uniform yellowish-green color, ornamented with vertical striæ, very fine and very close together. Spire moderate, conic, acute, with convex whorls separated by a linear and excavated suture. The fifth whorl is the largest, inflated and dilated, three prominent keels mark its contour, beginning on the preceding whorl. These three light lineations form a ribbon-like, flat carina. The aperture is as high, as wide, rounded, with a thin, sharp lip and smooth on the columellar border, thickened a little at its base by a small lamella, which covers in part the narrow umbilicus.

"Several individuals in all respects alike were 7 lines in height and 6 in diameter. This Paludina inhabits the sweet, fresh waters of the brooks of New Guinea."

While in some respects this description would apply to V. *costatus*, the dimensions given, alt. 17, diam. 15 mm., if from mature specimens, would indicate a much smaller and more globose species and his statement that the three lirations form a flat, ribbon-like (*rubanée et aplatie*) carina would seem to indicate that they were close together and, probably, at the periphery of the shell.

Moreover, Tapparone-Canefri (Fauna Moll. N. Guinea, Pt. I, 1883, p. 23) states that Beccari and d'Albertis found nothing like it in their collections. On the other hand, Pilsbry in commenting on another of Lesson's lost species, *Partula lineata* (Man. Con., XX, 1909, p. 312), remarks on "the general reliability of the locality records in the Zoology of the Coquille."

Thinking that possibly Lesson's type had been preserved in the Paris Museum, I requested Dr. Louis Germain to ascertain whether they were in the Museum. But he replied that much of their collection and nearly all of their types had been stored in the cellars for safety and that consequently the desired information could not be obtained at present. Now that the war is over, the Museum collections will, no doubt, be returned in due time to their normal condition and then, if the original types have been preserved, a critical examination can be made.

In view of the uncertainty as to just what Lesson's species is, it does not seem to be desirable to change the well-known and unquestioned name for the species until more definite information can be had in regard to the earlier one.

Viviparus costatus (Q. and G.) came from Lake Tondano, North Celebes and is described as being "very ventricose, fragile and thin, spire obtuse, whorls rounded, carinated by a considerable number of acute lirations, of which two or three are more prominent, and very finely longitudinally striate. Aperture almost circular, slightly angled above, umbilicus narrow and deep. Length 27.66, diam. 22.56 mm."

As shown by the original figures copied on pl. IX, figs. 9–10 and fig. 6 on pl. X from a specimen from Sukur, Celebes, labeled "*angularis* Müll." by Brot, the shell has two principal carinas, one at the periphery and the other forming the edge of the prominent, wide shoulder; between these are a number of lesser lirations, of which two are usually somewhat stronger than the others. The penultimate whorl is much smaller than the body-whorl owing to the width of the shoulder, and the spire is short and obtusely conical.

I have not seen any typical *V. costata* from the Philippine Islands.

Kobelt (Con. Cab., Viviparidæ, 1908, p. 230) has called attention to the fact that the shell figured by Bartsch (Pr. U. S. Nat. Mus., XXXII, 1907, pl. X, fig. I) from Luzon as typical "*angularis*" (*costatus*) does not represent the type from North Celebes. It was very properly united with *V. burroughianus* by Bartsch and will probably, when large series are obtained, be found to intergrade with it quite completely, but at present, at least, it seems entitled to varietal rank.

IX.

VIVIPARUS BURROUGHIANUS (Lea).

Paludina burroughiana Lea. Trans. Am. Phil. Soc., V, 1834, p. 113, pl. XIX, fig. 80; Obs.. I, 1834, p. 225, pl. XIX, fig. 80.

Paludina angularis Reeve. Con. Icon., Paludina, 1862, Sp. 14, pl. III, fig. 14.

Vivipara angularis burroughiana Bartsch. Pr. U. S. Nat. Mus., 1907, p. 136, pl. X, fig. 1.

Vivipara costata burroughiana Kobelt. Con. Cab., Viviparidæ, 1908, p. 232, pl. 46, figs. 7–8.

This is a characteristic species of the Philippine Islands. It differs from the *V. costatus* from Celebes by its larger size, more sloping shoulder, more elevated spire and stronger carination. As the oldest available name Lea's becomes the specific designation.

X.

VIVIPARUS BURROUGHIANUS TRINOMINIS n. n.

Paludina carinata Valenciennes. Rec. d'Observ. de Zool., 1833, p. 252, pl. LVI, figs. 2a–b; Haldeman, Mon., 1841, p. 27, pl. VIII; Kuster, Con. Cab. Paludina, 1852, p. 28, pl. VI, figs. 6–7; *non* Swainson, 1820–3.

Paludina multicarinata Haldeman. Mon., 1842, Pt. 4, p. 4 of cover; W. G. Binney, L. and F.-W. Shells, Pt. III, 1865, p. 22, fig. 40; *non* Cailliaud, 1826.

Vivipara angularis Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 135, pl. X, fig. 1; *non* Müller, 1774.

Valenciennes states that his species came from Mexico, but W. G. Binney (J. de Con., XV, 1867, p. 430) and Morelet (*Ibid.*, XVII, 1869, p. 405) from an examination of the types have confirmed the opinions of Frauenfeld (Verzeichniss, Paludina, 1864, p. 583) and von Martens (Mal. Blätt., 1865, p. 149) that it is undoubtedly the Philippine species commonly known as *V. costatus* (Q. and G.). The author himself states that his specimens were given to Humboldt by a member of the Royal Council of Manilla. Valenciennes' figure copied by

Haldeman is almost exactly the same as that given by Bartsch (l. c.) as the typical form of *V. angularis* (Müll.).

Haldeman's name was proposed on account of the priority of *Paludina carinata* Sw., but *multicarinata* has already been used by Cailliaud (Voy. Meroe, 1826, pl. IX, fig. 6) for another species, so that it is not available at the present time even in a varietal sense.

None of the earlier names proposed for this form being available and, as in the light of our present knowledge, the race seems worthy of varietal recognition, a new one is given as above.

Frauenfeld (Verzeichniss, Paludina, 1864, p. 571) considers this form as the same as *tricarinata* Ant., but if the figures given of that species by Philippi and Kuester correctly represent it, it is quite different.

XI.

VIVIPARUS TRICARINATUS (Anton).

Paludina tricarinata Anton. Verzeichniss, 1839, p. 52.

Anton did not figure his species and I have not been able to consult his original description. Kuester (Con. Cab., Paludina, 1852, p. 27) considered it to be a variety of *angularis* Müll. (*costatus* Q. and G.) "differing only in the sharper carinæ, two on the upper whorls and three on the last," and remarks that every gradation between the two forms is to be found.

Tricarinata is not mentioned by Reeve in the Conchologia Iconica nor by Kobelt in his recent monograph in the Conchylien Cabinet.

I have not seen any Philippine specimens that are referable to this species, but Bartsch's *zamboangensis* evidently groups with it, if we are justified in assuming that Kuester's figure (pl. 6, fig. 5), which he gives as a "mittelform" in the series between the typical form and the variety, fairly represents the species.

I have two specimens in the James Lewis collection (Coll. Walker, No. 12553) from Celebes (pl. IX, fig. 11), which agree fairly well with Kuster's figure above mentioned. They differ from typical *costatus* by their more elevated form, the sloping shoulder of the whorls and in the accentuation of the three principal carinas.

Philippi's figures of *tricarinatus* copied on pl. VIII, figs. 2–3, are not quite so much elevated and look not unlike *V. javanicus luzonicus* as figured by Kobelt (pl. 46, fig. 9) and herein. Philippi notes several minor differences between his specimens and Anton's description, but "has no doubt" but that his shells are correctly identified.

In the absence of specimens with their opercula, the standing of Anton's species and its relations to both *costatus* and *javanicus* must remain uncertain.

XII.

VIVIPARUS JAVANICUS LUZONICUS Kobelt. Pl. IX, fig. 8.

Vivipara javanica luzonica Kobelt. Con. Cab., Viviparidæ, 1909, p. 378, pl. 46, figs. 5, 9 and 10.

The Sarasins (Suessw. Moll. Celebes, 1898, p. 59) were the first to call attention to the radical difference in the opercula of the two species, *V. costatus* Q. and G. and *V. javanicus* v. d. Busch, which in their shell characters are often quite indistinguishable.

In *javanicus* and its allies the central part of the inner side of the operculum is occupied by a granulated area, which is surrounded by a smooth, polished border.

In *costatus*, on the other hand, the central portion is smooth and polished, but is surrounded by a narrow, distinctly granulated area and outside of this the remainder of the surface is smooth and polished like the centre.

Kobelt (l. c.) has described a race from Daraga, Luzon, which has the typical *javanicus* operculum, but in other respects closely resembles *costatus*. I have similar specimens with their opercula, figured above, which were collected in the Philippines by Steere, but no exact locality is given.

Among the shells received from Mr. Webb was a single specimen from Panique, Tarlac Prov., Luzon, which agrees in its shell characters with the Steere specimens, but unfortunately has no operculum.

If Anton's *tricarinata* should prove to be identical with this form, his name would have priority.

XIII.

VIVIPARA ZAMBOANGENSIS Bartsch. Pl. VIII, fig. 8.

Vivipara zamboangensis Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 137, pl. XI, fig. 19.

This species was also collected by Steere many years ago at Zamboanga. The operculum (fig. 8) shows that it belongs to the *javanicus* group. I have also received it from the Geneva (Switzerland) Museum, but without exact locality, labeled "*angularis* Müll." by Brot.

A single specimen (pl. IX, fig. 9) from Bugasong, Antique, Panay, was received from Mr. Webb, which resembles the typical form in shape, but differs in the details of the carination. The peripheral and shoulder keels are as in the type, but the central one has disappeared and the space between the two that remain is divided by four lesser keels, of which the two in the middle are a little more prominent; the whole surface is very finely, spirally lirate as in the type but rather stronger. The lip is black-edged and bluish-white within. The apical whorls are dark purple, which passes into a yellowish-green on the intermediate whorls and become a darker green on the body-whorl. The umbilicus is as in the typical form.

This form may be called *V. zamboangensis duplocinctus.*

The type (No. 45204 Coll. Walker) has 5½ whorls and measures: alt. 25.2, diam. 17.2 mm.

I am indebted to Dr. Pilsbry for photographic copies of Lister's description and figure and also of *P. carinata* Sw. and *N. angularis* Müll. And to Miss Mina L. Winslow of the Museum of Zoology, University of Michigan, for the reproduction of Philippi's figures of *P. tricarinata* Ant.

SUPPLEMENTAL NOTE.

Since the foregoing paper was written I find that Bavay found the original and unique type of *Paludina tricostata* Lesson in the Museum of Paris and figured it in his paper on the "Land and Fresh-Water Shells of New Guinea" (Nova Guinea, 1908, p. 270, pl. XIV, fig. 1). Unfortunately he added nothing to the meagre description of Lesson, but contented himself with giving an apparently excellent, life-size figure. Although he followed von Martens in considering it identical with *P. costata* Q. and G., I do not think that the figure in any way supports his conclusion. As shown by his figure, *tricostata* is a small, globose form with two visible carinas, the upper one scarcely more than a strong angle, the peripheral one is well developed, the third (and intermediate?) one, if it exists, is not shown in the figure.

Bavay associates with this as varieties two forms, one much larger and the other about of the same size, both of which are much more strongly carinated and have a funicular umbilicus surrounded with a strong carina. *Tricostata* has no indication of an umbilicus of this form and no umbilical carina. Bavay's varieties are certainly clearly distinct from *costata* and apparently so from *tricostata.*

Lesson's type came from Lac Sentani at Asc.

So far as can be determined from Bavay's figure *tricostata* is apparently specifically distinct from *costata* and Quoy and Gaimard's name should be used for the species described by them.

A HAWAIIAN FORM OF TAPES PHILIPPINARUM.

BY WM. ALANSON BRYAN.

From a reliable native fisherman I learn that this species of clam was plentiful at a certain locality in the mud-flats at Ewa, on Oahu, more than thirty years ago, but that it apparently completely disappeared from that locality. The native name "Okupi" was commonly used for the species then though more recently the name "Mahamoi" is sometimes used to distinguish it from the more common edible "Olepi" (*Tellina rugosa* Born).

The story given in accounting for the unusual nature name "okupi," which means leg-weary, tired or exhausted, is that "a long time ago a native chief with his family and attendants, while spending a day at the seashore, accidentally discovered this clam as they were wading in the soft oozie black mud, deposited in the estuary of the stream. None of them knew a name for the clam; no one had ever seen it before: it was a new